



**In the Claims**

The following is a complete listing of the claims and replace all prior claims in the application:

- 1        1. (Withdrawn) A method for forming self-pinned abutted junction heads, comprising:
  - 3              forming a first self-pinned layer having a first magnetic orientation, the first layer
  - 4              having a first end, a second end and central portion;
  - 5              forming a second self-pinned layer over only the central portion of the first self-
  - 6              pinned layer, an interlayer being disposed between the first and second self-pinned
  - 7              layers;
  - 8              forming a free layer in a central region over the second self-pinned layer; and
  - 9              forming a first and second hard bias layers over the first and second ends of the
  - 10          first self-pinned layer respectively, the first and second hard bias layer abutting the free
  - 11          layer, the first and second end of the first self-pinned layer extending under the hard bias
  - 12          layers at the first and second ends.
- 1        2. (Withdrawn) The method of claim 1 further comprising forming a spacer
- 2          layer over the first self-pinned layer and forming a first and second seed layer between
- 3          the first and second hard bias layer and the spacer layer.

1           3. (Withdrawn) The method of claim 2 further comprising forming  
2       amorphous layers between the spacer and the first and second seed layers, the amorphous  
3       layer stopping epitaxial growth between the first self-pinned layer and the first and  
4       second hard bias layers.

1           4. (Withdrawn) The method of claim 1 further comprising forming  
2       amorphous layers between the first self-pinned layer and the first and second hard bias  
3       layers for stopping epitaxial growth between the first self-pinned layer and the first and  
4       second hard bias layers.

1           5. (Withdrawn) The method of claim 1 further comprising forming first and  
2       second leads over the first and second hard bias layers.

1           6. (Withdrawn) The method of claim 1, wherein the forming the first and  
2       second hard bias layers further comprises electrically coupling the first and second hard  
3       bias layers to the free layer to allow sense current to pass through the free layer.

1           7. (Withdrawn) The method of claim 1, wherein forming the first and  
2       second hard bias layers over the first self-pinned layer further comprises providing a  
3       coupling of the self-pinned layers and the free layer to the first and second hard bias  
4       layers, the first and second hard bias layers being cooler than the central region to  
5       maintain pinning of the first and second hard bias layers, the maintenance of the pinning  
6       of the first and second hard bias layers maintaining the pinning of the free layer.

1           8. (Withdrawn) The method of claim 1, wherein the forming the free layer  
2 further comprises forming the free layer with a length selected for a desired track width.

1           9. (Original) A self-pinned abutted junction magnetic read sensor,  
2 comprising:

3           a first self-pinned layer having a first magnetic orientation, the first self-pinned  
4 layer having a first end, a second end and central portion;  
5           a second self-pinned layer formed over only the central portion of the first self-  
6 pinned layer, an interlayer being disposed between the first and second self-pinned  
7 layers;  
8           a free layer formed in a central region over the second self-pinned layer; and  
9           a first and second hard bias layers formed over the first and second ends of the  
10 first self-pinned layer respectively, the first and second hard bias layer abutting the free  
11 layer, the first and second end of the first self-pinned layer extending under the hard bias  
12 layers at the first and second ends.

1           10. (Currently Amended) The sensor of claim [[ 8 ]] 9 further comprising a  
2 spacer layer formed over the first self-pinned layer and a first and second seed layer  
3 disposed between the first and second hard bias layer and the spacer layer.

1           11. (Currently Amended) The sensor of claim [[ 9 ]] 10 further comprising  
2       amorphous layers formed between the spacer and the first and second seed layers, the  
3       amorphous layer stopping epitaxial growth between the first self-pinned layer and the  
4       first and second hard bias layers.

1           12. (Currently Amended) The sensor of claim [[ 8 ]] 9 further comprising  
2       amorphous layers formed between the first self-pinned layer and the first and second hard  
3       bias layers for stopping epitaxial growth between the first self-pinned layer and the first  
4       and second hard bias layers.

1           13. (Currently Amended) The sensor of claim [[ 8 ]] 9 further comprising first  
2       and second leads formed over the first and second hard bias layers.

1           14. (Currently Amended) The sensor of claim [[ 8 ]] 9, wherein the first and  
2       second hard bias layers are electrically coupled to the free layer to allow sense current to  
3       pass through the free layer.

1           15. (Currently Amended) The sensor of claim [[ 8 ]] 9, wherein the first and  
2       second hard bias layers are cooler than the central region to providing stable pinning of  
3       the free layer.

1           16. (Currently Amended) The sensor of claim [[ 8 ]] 9, wherein the free layer  
2       includes a length selected for a desired track width.

1           17. (Original) A magnetic storage system, comprising:  
2           a moveable magnetic storage medium for storing data thereon;  
3           an actuator positionable relative to the moveable magnetic storage medium; and  
4           a magnetoresistive sensor, coupled to the actuator, for reading data from the  
5           magnetic recording medium when positioned to a desired location by the actuator, wherein  
6           the magnetoresistive sensor further comprises:  
7                 a first self-pinned layer having a first magnetic orientation, the first self-  
8                 pinned layer having a first end, a second end and central portion;  
9                 a second self-pinned layer formed over only the central portion of the first  
10               self-pinned layer, an interlayer being disposed between the first and second self-pinned  
11               layers;  
12                 a free layer formed in a central region over the second self-pinned layer;  
13                 and  
14                 a first and second hard bias layers formed over the first and second ends of  
15                 the first self-pinned layer respectively, the first and second hard bias layer abutting the  
16                 free layer, the first and second end of the first self-pinned layer extending under the hard  
17                 bias layers at the first and second ends.

1           18. (Currently Amended) The magnetic storage system of claim [[ 14 ]] 17  
2           further comprising a spacer layer formed over the first self-pinned layer and a first and  
3           second seed layer disposed between the first and second hard bias layer and the spacer  
4           layer.

1           19. (Currently Amended) The ~~sensor~~ magnetic storage system of claim  
2   [[ 15 ]] 18 further comprising amorphous layers formed between the spacer and the first  
3   and second seed layers, the amorphous layer stopping epitaxial growth between the first  
4   self-pinned layer and the first and second hard bias layers.

1           20. (Currently Amended) The ~~sensor~~ magnetic storage system of claim  
2   [[ 14 ]] 17 further comprising amorphous layers formed between the first self-pinned  
3   layer and the first and second hard bias layers for stopping epitaxial growth between the  
4   first self-pinned layer and the first and second hard bias layers.

1           21. (Currently Amended) The magnetic storage system of claim [[ 14 ]] 17  
2   further comprising first and second leads formed over the first and second hard bias  
3   layers.

1           22. (Currently Amended) The magnetic storage system of claim [[ 14 ]] 17,  
2   wherein the first and second hard bias layers are electrically coupled to the free layer to  
3   allow sense current to pass through the free layer.

1           23. (Currently Amended) The magnetic storage system of claim [[ 14 ]] 17,  
2   wherein the first and second hard bias layers are cooler than the central region to  
3   providing stable pinning of the free layer.

1           24. (Currently Amended) The magnetic storage system of claim [[ 14 ]] 17,  
2       wherein the free layer includes a length selected for a desired track width.

1           25. (Original)    A self-pinned abutted junction magnetic read sensor,  
2       comprising:

3           a first means for providing a first self-pinned layer having a first magnetic  
4       orientation, the first means having a first end, a second end and central portion;  
5           second means for providing a second self-pinned layer formed over only the  
6       central portion of the first means, an interlayer being disposed between the first and  
7       second means;

8           a third means for providing a free layer formed in a central region over the second  
9       means; and

10          a fourth and fifth means for providing first and second hard bias layers, the fourth  
11       and fifth means being formed over the first and second ends of the first means  
12       respectively, the first and second means abutting the third means, the first and second end  
13       of the first means extending under the fourth and fifth means at the first and second ends.

1           26. (Original)   A magnetic storage system, comprising:  
2                 a moveable magnetic storage means for storing data thereon;  
3                 an actuator positionable relative to the moveable magnetic storage medium; and  
4                 a magnetoresistive sensor, coupled to the actuator, for reading data from the  
5                 magnetic recording medium when positioned to a desired location by the actuator, wherein  
6                 the magnetoresistive sensor further comprises:  
7                         a first means for providing a first self-pinned layer having a first magnetic  
8                 orientation, the first means having a first end, a second end and central portion;  
9                         second means for providing a second self-pinned layer formed over only  
10                 the central portion of the first means, an interlayer being disposed between the first and  
11                 second means;  
12                         a third means for providing a free layer formed in a central region over the  
13                 second means; and  
14                         a fourth and fifth means for providing first and second hard bias layers, the  
15                 fourth and fifth means being formed over the first and second ends of the first means  
16                 respectively, the first and second means abutting the third means, the first and second end  
17                 of the first means extending under the fourth and fifth means at the first and second ends.